The international newsletter on child health and disease prevention

CHILD HEALTH DIALOGUE

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1st quarter 1997 Issue 6

Malaria: a continuing threat

hildren are particularly at risk from malaria.

One hundred years ago Ronald Ross described how mosquitoes arry malaria and hoped that the sease would soon be eliminated. owever, malaria is still an enormous obal public health problem. It is one the five leading causes of death in ildren under five and often occurs in mbination with other childhood nesses. WHO estimates that over ne million children a year die of alaria. Any plan to improve the ealth of people living in malaria ndemic areas must include the fective recognition, prevention and eatment of malaria.

tegrated approach

his issue of *CHD* looks at malaria ntrol in the context of integrated anagement of childhood illness. A ecial *Health Action* supplement ldresses some of the policy issues strict level health workers face. This the first time the two newsletters have worked together to produce a joint issue. This collaboration underscores the need to approach the challenge of malaria control in an integrated and multi-sectoral manner.

Health workers need to understand how malaria is transmitted and who is most at risk. Kevin Marsh explains how mosquitoes transfer the disease from person to person and how immunity to the parasite is gained. Lack of immunity explains why children, pregnant women in endemic areas and migrants to these areas are at risk of life-threatening malaria. Any practical plan to reduce deaths from malaria must begin with recognising and treating the disease. Malcolm Molyneux describes how to distinguish mild and severe malaria from other diseases. Christine Luxemburger explains how to treat and monitor children with malaria and Jane Carter discusses the management of anaemia.

Immunity to malaria is weakened in pregnancy. Katie Reed outlines how to manage the particular problems malaria poses for pregnant women.

Prevention

Prevention is always better than cure. Several recent large-scale trials in Africa have shown that insecticide treated bed nets can reduce both morbidity and mortality from malaria. Chris Curtis and colleagues discuss the use of these nets and explore ways of reducing transmission.

Despite all the global efforts at control, people will continue to be infected with malaria for some years to come in most areas of tropical Africa, Asia and the Pacific. Malaria may become even more of a problem for two reasons. First, the parasite can become resistant to commonly used drugs. In most parts of the world the *falciparum* parasite is already resistant to chloroquine. Experience in South-East Asia suggests resistance to other drugs may soon follow. Second, migration of non-immune people into endemic areas may increase the number of people at risk from the disease.

Effective malaria control programmes need the collaboration of communities and health workers at local, regional and national levels. *CHD* hopes that the articles in this issue and the *Health Action* supplement will help all those working to reduce death and disease from malaria.

David Roberts and Harry Campbell

including special 4 page supplement **HEALTH Action**

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Dangerous injection practices

The photo on page 10 of *CHD2* shows a health worker giving an intramuscular (IM) injection to a baby. The baby's position is awkward and it looks as if the injection is being given in a dangerous place, near the sciatic nerve. I believe that small babies should always be held firmly and injected in the side or front of the mid-thigh, but not as high as shown in the photo. An alternative is the upper outer quarter of the buttock, but this is not usually recommended for small babies, because of increased risks of nerve damage and abscess formation. Could a paediatrician comment or explain?

Mary Gavin, Health Training Adviser, SCFA, PO Box 1149, Honiara, Solomon Islands

Dr William Cutting replies:
The photo does show a grandmother **not** adequately supporting a baby having an injection. As you correctly point out, babies should receive intramuscular injections into the side of the thigh while the mother supports the arm and trunk of the child with one hand and restrains the legs with the other (see illustration, right). However, even if the nurse in the previous photo was injecting in the upper thigh, this is not very near the main blood vessels or sciatic nerve.

Dr William Cutting, Department of Child Life and Health, University of Edinburgh, 20 Sylvan Place, Edinburgh EH9 1UW, UK

Source: Daphne Paley-Smith

Mixing drugs with food

Your home care article in *ARI News* 29 advises teaching mothers to mix drugs for children with food. I believe this is wrong because food affects drug absorption. Therefore a drug should be taken some time before or after food. Mothers should be asked to mix crushed tablets with adequate water. Drugs are more easily absorbed in liquid.

Dr S E Nmosi, Faculty of Basic Medical Sciences, PMB 14, Ekpoma, Edo State, Nigeria

Dr A Pio, WHO consultant, replies:
Dr Nmosi raises an interesting and important question. There is no universal recommendation about whether to mix antibiotics with food for children. Each antibiotic has to be considered separately.

Food generally decreases the rate and extent of absorption of ampicillin. So, ampicillin should be given at least one hour before meals. However, oral ampicillin should be avoided in the treatment of pneumonia, acute otitis media and sinusitis in children, as it can cause diarrhoea, nausea and vomiting.

Studies of chloroquine in adults indicate that chloroquine is more readily available when given with food than when it is given several hours before meals. The rate of absorption is not affected, but the concentration level of chloroquine in the blood is higher.

WHO recommends either amoxycillin or cotrimoxazole for the treatment of non-severe pneumonia and other acute bacterial respiratory infections in children. Both these drugs are equally well absorbed with or without food.

Antonio Pio, Consultant, WHO, CH-1211 Geneva 27, Switzerland

Correction: *the dosage levels of IM quinine for treatment of older children with severe malaria, given in* CHD*3/4 page9, were incorrect. The correct dosage appears in this issue on page 11. We apologise for this error.*

TERMS & DEFINITIONS

This box explains some of the technical terms used in this issue.

Anaemia – reduced levels of haemoglobin in the blood.
Antimalarial – a drug that kills malaria parasites.
Chemoprophylaxis – the use of drugs to prevent disease.
Endemic diseases – those which exist in a particular area or region.
Haematocrit – a blood test measuring the proportion of red cells to plasma, often used as a measure of anaemia.
Haemoglobin – the substance inside red blood cells that carries oxygen.
Immunity – protection from an infectious disease learnt by the body after exposure to the bacteria, virus or parasite.
Pallor – abnormally pale colour of the palms, skin under the fingernails, or mucous membranes of the eyes (conjunctiva) found in many children with anaemia.
Parasite – an organism which lives on another organism.
Parasitaemia – the presence of parasites in the blood.

Limited resources

I would like to respond to the double issue of *CHD*3/4 on 'Saving lives in hospital'. In Tanzania over 80 per cent of the population live in rural areas. Existing health facilities include health posts, dispensaries and health centres. Hospitals are rare, therefore most children's lives are saved in other types of facilities. Many rural health facilities are in short supply of nurses, medical staff, medical equipment and medicine. Most of the antibiotics mentioned in the issue are not available. Also the distance between most health facilities and the first referral level is a one or two day trip.

Health worker, Juakali Rural Dispensary, Nshupu village, PO Box 212, Usa River, Arusha, Tanzania

Editor's note: *We realise not all sick children can be referred and that clinics and health centres do not have the same drugs as hospitals. A future issue of* CHD *will give guidelines for caring for sick children where referral is not possible.*

Malaria: an overview

***Kevin Marsh** explains how malaria spreads.*

Early diagnosis and correct treatment of malaria are important.

Malaria is one of the most important causes of illness and death in children in hot countries. There are four different types of parasite that cause malaria (see box). The most dangerous, *Plasmodium falciparum*, is mainly found in sub-Saharan Africa, where malaria kills more than one million children a year.

How do we get malaria?

Malaria parasites are transmitted from person to person by *Anopheles* mosquitoes (see box on page 4). Many different species of *Anopheles* mosquito can transmit malaria. Differences in mosquito behaviour determine where, when and to whom, malaria is transmitted. Species which live mostly in forests and feed during the day present the biggest risk to people who enter forests for work. Other species which live in or around people's homes and feed at night are a risk to everyone.

In many areas mosquitoes breed rapidly following rains, leading to sudden increases in malaria transmission – the malaria season. In areas with more constant rainfall, malaria may be transmitted all year. Activities such as irrigation schemes may provide new sites for mosquitoes to breed and increase the rate of malaria.

Who gets malaria?

Anyone who is bitten by an infected mosquito can get malaria. The risk of getting malaria and the severity of the disease depend on a person's resistance to the parasite.

Some people are born with characteristics that protect them from severe malaria. But the most important resistance to the parasites occurs as the body learns to fight the infection with antibodies and cells that kill and remove parasites. This is called immunity and it develops after repeated attacks of malaria. Immunity is never complete, but it can limit the severity of the disease.

In endemic areas with heavy transmission of malaria, immunity develops quickly. Young children have the most frequent and severe attacks of malaria. Older children and adults still get malaria, but attacks become less frequent and less severe as immunity builds up.

In non-endemic areas, malaria is less common; therefore immunity develops slowly or not at all. In such areas, both children and adults are at risk of the serious effects of malaria. They are particularly at risk if they travel to, or work in, endemic areas if they have not taken measures to prevent malaria.

During pregnancy, immunity to malaria is reduced. This may lead to severe illness in the mother, particularly anaemia, which may affect the growth of the fetus, causing low birth weight. In areas where women have no immunity at the start of pregnancy, malaria is particularly severe and may lead to the death of the mother or to a miscarriage (see page 9).

Drug resistance

Early diagnosis and correct treatment of malaria are very important if severe disease and death are to be avoided. However, resistance to many antimalarial drugs is becoming increasingly common. In parts of South-East Asia some parasite strains are resistant to most antimalarials. Currently the biggest problem is in Africa where, in some countries, the use of chloroquine as a first-line drug is now being questioned. Health workers have to work with available drugs. However, they must be aware of the problem of drug resistance and be able to recognise treatment failure. This requires the rapid and proper use of an alternative drug. Delay in recognising treatment failure may lead to death.

Inappropriate use of antimalarials contributes to the spread of resistance. Self-medication is a common practice in many countries. Health workers can play an important role in ensuring that community members understand when to take antimalarial drugs, the correct dosage and length of treatment.

Kevin Marsh, KEMRI, CRC, Kilifi Unit, PO Box 230, Kilifi, Kenya

FACTS ABOUT malaria

- Malaria is caused by tiny parasites that grow in red blood cells. They can multiply 10 times every two days and invade new cells. Eventually they may cause fever or more severe illness such as anaemia or coma.
- Malaria parasites are spread by the bite of the female *Anopheles* mosquito.
- There are four types of malaria parasites. *P. falciparum* is the most dangerous type which causes cerebral malaria. *P. vivax* causes a milder type of malaria. The other two malaria parasites (*P. ovale* and *P. malariae*) are less common.
- Children under five and pregnant women are most at risk of death from malaria.

Preventing malaria

***Chris Curtis, Jo Lines** and **Daniel Chandraniohan** describe ways to reduce the risk of mosquito bites.*

Two main methods can reduce bites from the mosquitoes which spread malaria:

- spraying inside homes with insecticide
- encouraging people to sleep under insecticide treated bed nets.

Insecticide spraying

In the 1950s and 1960s, governments in many countries organised programmes of house spraying with insecticides, especially DDT to kill *Anopheles* mosquitoes as they rested after feeding. Major progress was made in preventing malaria in Asia and Latin America. However, there were two problems: mosquitoes became resistant to DDT, and spraying programmes were difficult to maintain. Modern pyrethroid insecticides work better than DDT; however, use of insecticide treated bed nets is increasingly being encouraged to reduce mosquito bites.

Chris Curtis

FACTS ABOUT mosquitoes

- *Anopheles* mosquitoes are distinguished from other mosquitoes by their 'tail in the air' posture.
- When mosquitoes bite humans they suck up blood. If the person they bite has malaria, parasites in this blood breed and develop in the mosquito. When the mosquito feeds on another person, parasites are injected with the mosquito's saliva.
- Every two or three days throughout their life, the female mosquitoes seek blood, which is used to provide protein for development of their eggs.
- Almost all *Anopheles* mosquitoes feed at night. After feeding, mosquitoes usually rest on the walls or ceiling while they digest the blood.
- *Anopheles* mosquitoes usually lay their eggs in puddles (shallow water) and irrigation water, **not** in smelly polluted water or water-filled garbage (in which *Culex* and *Aedes* mosquitoes lay).
- The eggs hatch into larvae which float parallel to the surface. After about a week at tropical temperatures, the larvae have grown up and emerge as adult mosquitoes from the water.

Insecticide treated bed nets

Provided people sleep under nets, the effectiveness of treated nets appears to be similar to that of spraying houses, but less insecticide is needed. Pyrethroids used to treat nets are safe even when in close contact with people.

Mosquitoes are attracted by the carbon dioxide and other chemicals given out by people. Mosquitoes are killed or repelled when they come into contact with insecticide on a treated net. Insecticide also helps to prevent mosquitoes entering the net through holes or feeding on an arm or leg through the net.

Nuisance biting by mosquitoes and by other domestic insects is a major problem in many places. For many people, reducing the nuisance biting rather than controlling malaria may be the motivation needed to encourage bed net use.

Treating nets

Nets are treated by dipping them in a mixture of liquid insecticide concentrate and water. (Powder formulations and those made for agriculture are **not** suitable.) There are five key steps to treating a net:

- prepare
- measure and dilute
- dip
- dry
- clean up safely.

1 Prepare

Treat nets outside or in a well ventilated building. Wear long rubber gloves when dipping to prevent the insecticide irritating the skin. Collect a small measure (10 or 100ml), a large measure (1 litre) and a mixing container – plastic bag (suitable for one net), bowl, bucket or bin. Wash all used nets before treatment and dry them.

2 Measure and dilute

You need to know:

- how many nets need dipping?
- what size are they?
- how much water do they absorb?
- how much insecticide is required?

By working out the calculation for an individual net of each type, you can develop a simple chart for future dipping. The box on page 5 provides the calculations you need. After calculating, measure the amount of insecticide concentrate required and add it to the required amount of water in the mixing container.

Dip

ets should be clean and dry. Soak ch net in the diluted insecticide until it thoroughly wet. Wring out the net, or it drip for a while so that the excess secticide goes back into the container.

Dry

ets can be hung up or laid flat on a ed to dry. In either case, arrange the et with as few folds as possible and rn it occasionally to ensure that the secticide is deposited evenly.

With individual nets, a plastic bag an be used to mix the insecticide, dip he net, and carry it home to be dried.

Clean up safely

fter treating nets, put packaging and ny waste insecticide in a pit latrine or ury them. Thoroughly wash hands, rms, clothes and equipment.

Care and use

Re-treat nets once or twice a year or more often if washed frequently, as washing reduces the concentration of insecticide. The net should be hung up above the bed and used every night. When in use it should hang down to cover the whole bed and be tucked under the mattress or sleeping mat. In the daytime it should be tied up out of the way so it is not damaged.

Other mosquito control methods

Treated bed nets and house spraying both target the adult mosquito. Attacks on mosquito larvae are also possible. However, *Anopheles* mosquitoes fly large distances. Enough larvae are killed only if all breeding places within about a kilometre of the village are found and dealt with by:

- draining puddles and ponds
- screening the water tanks in which some *Anopheles* breed (especially in towns in India and Pakistan)
- using appropriate insecticides
- stocking selected breeding places with fish that eat the larvae.

Chemoprophylaxis

Chemoprophylaxis helps protect visitors to highly endemic areas. However, there are concerns about the use of chemoprophylaxis to protect local populations, and policies vary.

In endemic areas, groups likely to benefit most from chemoprophylaxis are young children, pregnant women (especially first-time mothers) and migrants from areas with low prevalence of malaria.

Antimalarials taken by people in these groups help reduce the risk of clinical malaria and associated complications. However chemoprophylaxis has limitations. Drugs are expensive and effective coverage of groups at risk is difficult to achieve and to sustain. Chemoprophylaxis may encourage drug resistance. Health workers should refer to national guidelines.

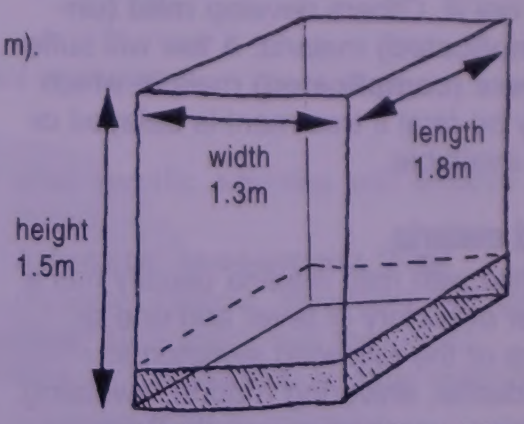
Chris Curtis, Jo Lines, Daniel Chandraniohan, London School of Hygiene and Tropical Medicine, Keppel Street, London WC1E 7HT, UK

1. How much water?

Put a measured amount of water – say two litres – into a bucket.
Soak a net in the water until it is totally wet.
Carefully wring out the net over the bucket.
When the net has stopped dripping, measure the water left in the bucket.
Subtract this amount from the original amount of water.
The difference is the amount absorbed by the net.
Multiply this amount by the number of nets to be dipped,
add 10 per cent, and put that amount of water in the mixing container.

2. How big is the net?

Calculate the area of the net in square metres (sq m).
For example, for rectangular nets:
Hang the net up.
Measure the width, length and height (in metres).
a) Calculate the area of the top: width x length.
b) Calculate the area of the sides and ends:
height x total distance around base of net.
c) Add the a and b calculations together
for the total area of the net. For example:
a) 1.3 x 1.8 = 2.3sq m
b) 1.5 x 6.2 = 9.2sq m
c) 2.3 + 9.2 = 11.5sq m



3. How much insecticide?

Use the following formula to calculate the amount of insecticide required:

$$\frac{\text{recommended dosage (mg/sq m) x area of net}}{\text{concentration of insecticide (\%) x 10}}$$

See the table below for recommended dosage of different formulations of insecticide.
Check the insecticide label for the concentration.
Some manufacturers label their products in per cent (this means g/100ml) and some in g/litre.
Fifty per cent (50%) is the same as 500g/litre.
For example: The amount of permethrin 50% needed to give a recommended dosage of 200mg/sq m on a 11.5sq m net is:

$$\frac{200 \times 11.5}{50 \times 10} = 4.6\text{ml insecticide}$$

Multiply this amount by the number of nets to be dipped and add 10 per cent. Measure this amount of insecticide and mix it with the amount of water previously measured.

4. Set up your own chart

Once you have done the initial calculation, you can use the amount of insecticide and the amount of water as the proportions you need for all nets made of similar material.
For example, if the amount of insecticide is approximately 5ml per net, and the amount of water absorbed by this type of net is 500ml, you will need one part of insecticide for 100 parts of water.
In future, you then only need to check the volume of water needed for the number of nets requiring treatment, to work out the amount of insecticide needed.

Insecticides for dipping nets

Compound	Trade names	Concentrations commonly available expressed as		Recommended dose of insecticide per sq metre of netting
		g/litre	%	
Permethrin	Peripel	200	20%	200mg/sq m
	Imperator	500	50%	200mg/sq m
Deltamethrin	K-Othrin	25	2.5%	25mg/sq m
Lambdacyhalothrin	Icon	25	2.5%	10mg/sq m
Cyfluthrin	Solfac	50	5%	50mg/sq m
Etofenprox	Vectron	100	10%	200mg/sq m
Alphacypermethrin	Fendona	100	10%	20mg/sq m

Recognising malaria

***Malcolm Molyneux** provides guidelines on how to identify malaria in children.*

In endemic areas, most people who have malaria parasites in their blood are not ill. Others develop **mild (uncomplicated)** malaria. A few will suffer **severe (complicated)** malaria which may be fatal if treatment is delayed or not available.

Mild malaria

A child with mild malaria usually has a fever or history of fever and one or more of the following symptoms: headache, shivering (rigors), sweating, malaise, vomiting or cough. Because fever varies, check for a history of recent fever even if the child has a normal temperature when examined.

Malaria can mimic almost any infection. It is particularly difficult to distinguish malaria from acute respiratory infection (ARI), since both illnesses may cause cough, fever and rapid breathing, especially in young children. Malaria commonly causes vomiting and mild diarrhoea, but severe diarrhoea is more likely to be caused by a gastrointestinal infection.

Physical signs such as pallor, fever or an enlarged spleen are not diagnostic. Examining a stained blood film under a microscope will show if a child has malaria parasites in the blood (parasitaemia). This does not prove the parasites are causing the illness, but the more dense the parasitaemia, the more likely it is to be the cause of disease. A child with more than 10 per cent of red cells containing parasites, in an endemic area (or more than 4 per cent in a non-endemic area) is at increased risk of developing severe malaria.

Thick and thin blood films can be done quickly and cheaply, but the procedure requires special equipment and someone skilled in using a microscope. A mild infection is more likely to be seen on thick films than on thin films. If a blood film is negative it may be useful to repeat it the next day if malaria is still a possible diagnosis.

Because malaria cannot be diagnosed accurately on the basis of signs and symptoms alone and it is not always possible to take blood films, health workers cannot always be sure whether a child has malaria. Depending on national guidelines, in endemic areas, treat all children who have fever for malaria, even if other illnesses are present and also being treated. For example, a child in an endemic area who comes with a cough, fever and fast breathing should be treated with both an antibiotic (for pneumonia) and an antimalarial.

Severe malaria

This a medical emergency caused only by *P. falciparum*. Malaria is severe if a child has one or more of the following complications:

- altered consciousness or coma
- repeated convulsions
- severe weakness
- acidosis (deep rapid breathing)
- severe pallor (indicating severe anaemia)
- jaundice
- hypoglycaemia (blood glucose less than 2.5mmol/l or 3mmol/l in malnourished children)
- kidney failure (no urine passed for several hours)
- shock (clammy skin, weak rapid pulse)
- hyperparasitaemia (in areas of low transmission).

Other less common features of severe malaria are:

- haemoglobinuria (dark or blood coloured urine)
- tendency to prolonged bleeding.

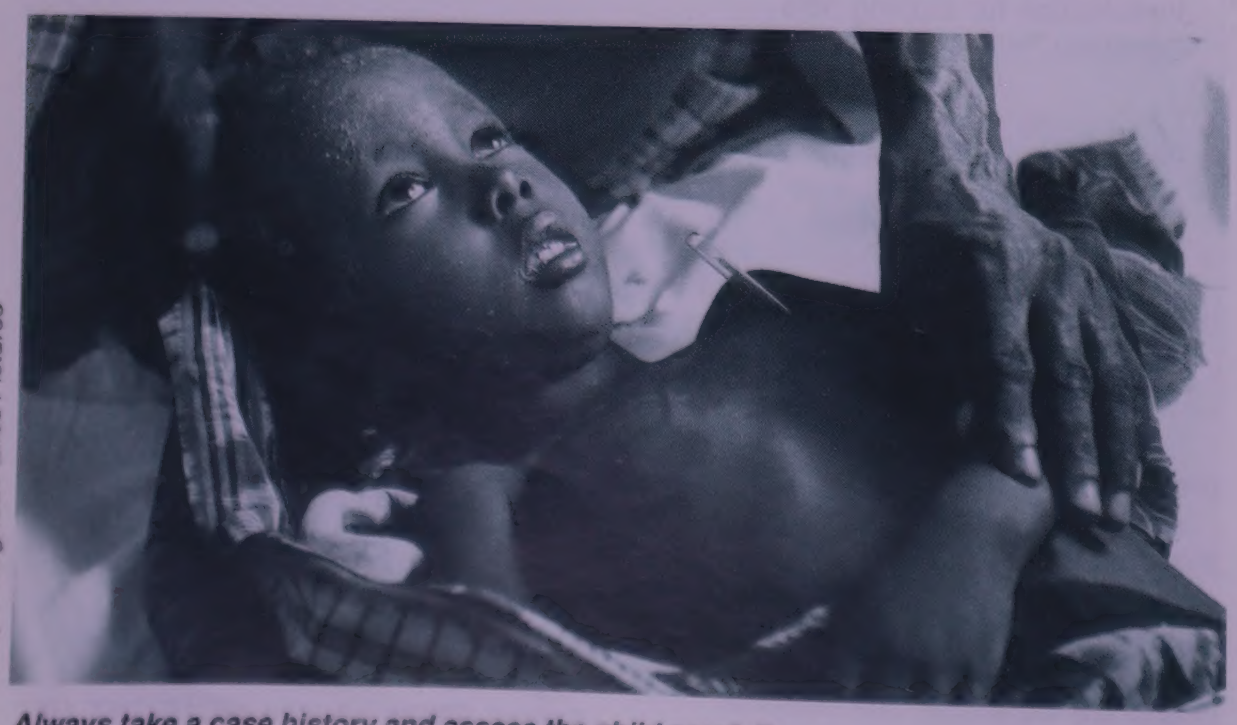
None of the complications of severe malaria is specific to malaria. For each complication, examine the child carefully and think of other possible causes. For example, a lumbar puncture may distinguish malarial coma from meningitis; careful re-examination may distinguish malarial acidotic (deep) breathing from the shallower, laboured breathing of pneumonia. Check blood films, repeat if necessary and reassess the child regularly.

Lack of immunity and delayed, incorrect or ineffective treatment increase the risk of severe malaria. Therefore always take a detailed history and assess the child carefully.

Malcolm Molyneux, Wellcome Trust Centre, Box 30096, Blantyre 3, Malawi

Key messages

- Malaria and other infections often appear similar; look carefully for clues in history and examination.
- Severe malaria may develop during the course of treatment for mild malaria, especially if the treatment is incorrect or delayed, or if the drugs are ineffective.
- A positive blood film helps diagnosis, but it does not prove that the child's illness is due to malaria; look for other illnesses too.
- A child may present with a complication without history of fever. If malaria is not considered the diagnosis may be missed.



Crispin Hughes/Panos Pictures

Always take a case history and assess the child carefully.

he international newsletter on implementing primary health care

HEALTH Action

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1st quarter 1997 Issue 17

Controlling malaria

Sylvia Meek looks at the impact of malaria and the new challenges facing district managers.

Health workers in developing countries deal with many cases of malaria but they may not realise its true importance and cost. In Africa, malaria is one of the major causes of death and accounts for up to 40 per cent of outpatient visits. In Asia, the impact is not so severe but malaria is difficult to control because of multiple drug resistance.

At the district level malaria is often the most important single cause of death and illness. Studies by district health management teams (DHMTs) in Uganda found that malaria caused almost 30 per cent of the 'disease burden', far ahead of AIDS, diarrhoea and maternal deaths.

Yet the impact of malaria is often under-estimated and it rarely receives a fair allocation of funding. Malaria is so common that it is often unreported or classified as 'fever'. Many adults consider episodes of malaria a normal part of life and do not seek medical help. Instead, they are likely to use traditional remedies or buy medicines direct from pharmacists, shops or street traders. In turn, widespread and often inappropriate use of antimalarials has resulted in increasing drug resistance.

Better malaria prevention and control could lead to long-term benefits for health systems as a whole. Considerable savings could be made on drug costs. Staff and resources used in treating malaria could be used elsewhere.

A new role for districts

Until recently, planning of malaria prevention and control was mainly the responsibility of Ministry of Health specialists, usually in a malaria control unit. District level workers had little direct responsibility for planning.

One of the most promising developments in malaria control has been the realisation that responsibility goes beyond a few people in the Ministry of Health. As page 3 of *Child Health Dialogue* shows, the incidence and type of malaria varies considerably with geography, season and living conditions. Different groups of people have different beliefs and perceptions about malaria. They have different ways of dealing with it and respond to different messages about it.

All these factors mean that effective treatment, prevention and control cannot be left to national level planners alone but must be tackled at community level. The DHMT can play a vital role in this process, particularly where decisions are delegated to district level. Rather than merely implementing pre-agreed plans within allocated budgets, increasingly DHMTs are expected to take greater responsibility for surveying, planning, allocating resources and budgeting.

The effective management of control services at the district level requires well-developed plans which follow a logical sequence. Suggested steps are:

Analyse the situation: What are the epidemiological characteristics, type of people at risk, epidemic potential? What resources (people, materials, funding) are available?

Set priorities: What areas and groups suffer most? What will your resources allow you to do first?

Consider alternative approaches: Which approach is likely to bring the best results?

Develop objectives: What overall objective is realistic and measurable (for example, to reduce malaria deaths by 30 per cent over five years)?

Define outputs and activities: What specific results do you expect and what specific activities will achieve them?

Allocate resources: What resources (people, materials) will you need? How much will they cost?

Set a timetable: In what order do activities need to occur?

Determine roles and responsibilities: Who does what and when? Are there training needs related to these roles and responsibilities?

Monitor and evaluate: What indicators can you use to monitor activities, timetables and budgets and to evaluate the results?

Dr Sylvia Meek, Malaria Consortium, London School of Hygiene and Tropical Medicine (see page 4 for details).

J Rudleston/WHO

Taking blood films is an essential part of a malaria control programme.

CONTENTS

Building partnerships

Studies and experience from different parts of the world show that involving communities in malaria control activities is essential.

Communities have to be involved for malaria prevention and control strategies to be effective and sustainable. This means developing effective partnerships between health services and communities.

Accurate information and a common understanding of the problems are the keys to making good decisions about health. Neither the community nor the health worker has all the information. Sharing information helps to develop a partnership, improve understanding, and increase community involvement in the decisions about what actions to take to deal with malaria.

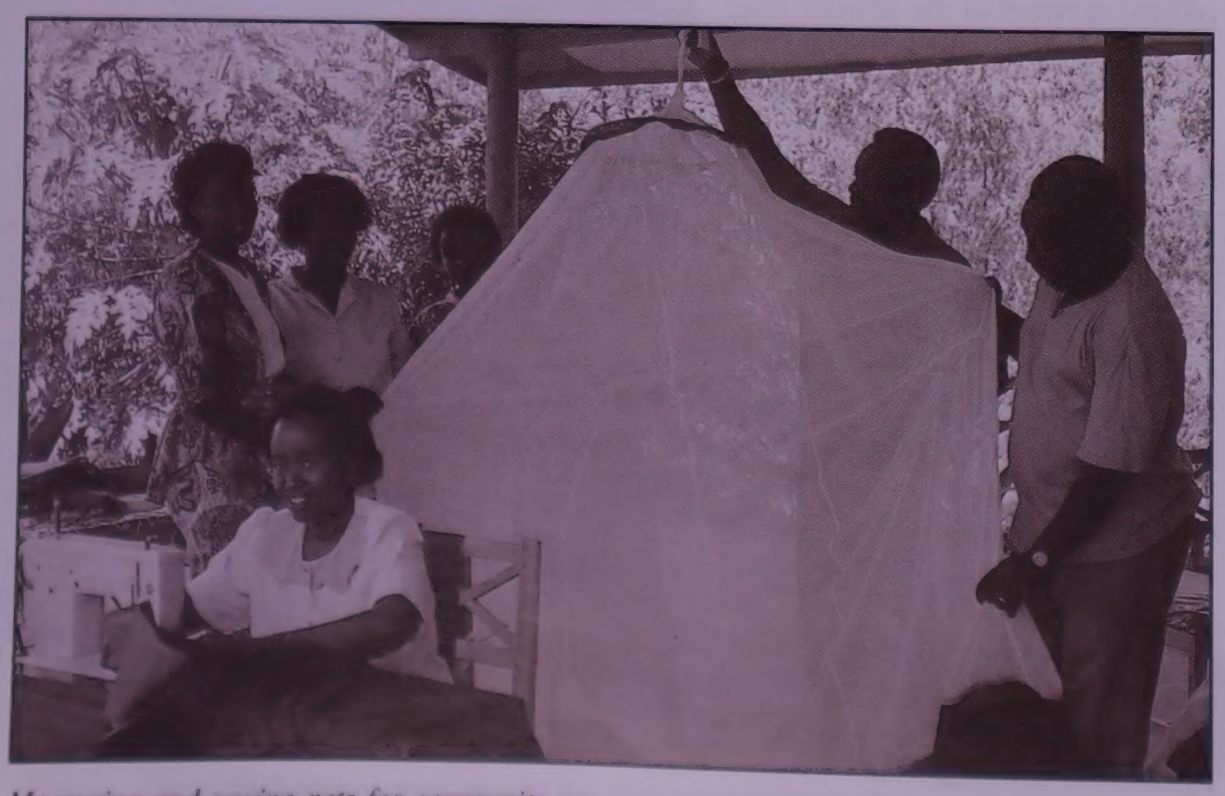
An effective partnership helps to turn the decisions made into practical action and long-term change. The involvement of the community may include exploring the knowledge and beliefs that people have about malaria, how they recognise and treat it, and what steps they can take to prevent malaria.

Some examples of community involvement and partnership in malaria control are being demonstrated in a series of pilot projects (or 'trials') of insecticide treated nets. Pilot projects have taken place in many areas in Africa and Asia. Most have been sponsored by international agencies in collaboration with national health ministries. While their focus and methodology varies, they usually look at a range of issues including:

- what people understand about the causes and symptoms of malaria
- the role of insecticide treated nets in reducing malaria
- how people adapt and use insecticide treated nets
- the financial and other problems people have in obtaining nets and insecticides
- difficulties about the timing and process of re-treating nets
- how health workers communicate messages about malaria control
- how systems, at district and community level, can sustain the distribution and use of insecticide treated nets.

The experience from these pilot projects is providing a useful basis for planning larger scale sustainable efforts in malaria control and for integrating the use of nets into existing community-based programmes.

This overview looks at two pilot projects: in Zambia and in eastern India. They show that involving communities can be very effective in controlling malaria.



Katie Reed

Measuring and sewing nets for community use.

Zambia

The Community-based Malaria Control project in Samfya district was based on the 1995 action plan developed by the Samfya DHMT with assistance from the national Malaria Control Centre and UNICEF. The plan aimed to build the capacity of staff and volunteers and to mobilise communities to tackle malaria through the distribution and treatment of nets.

The first step was to train the DHMT using a curriculum developed for the project. The DHMT then trained staff based at rural health centres using a simpler version of the curriculum in the local language. The curriculum included an introduction to the national malaria control strategy, transmission of malaria and its clinical features, management of severe malaria and malaria in pregnancy, collection of data and prevention through the use of insecticide treated nets. The staff were also trained in basic accounting.

The project worked in three communities. Each village nominated 10 people as 'malaria agents'. These agents were trained by rural health centre staff using a simplified version of the curriculum. On return to their villages the agents formed malaria control committees.

In mid-1995 the DHMT began distributing nets, insecticides and other supplies to malaria control committees. The committees were responsible for selling nets, re-treating them regularly and ensuring people knew how to use them correctly. Committees organised their systems to suit local circumstances, including setting a fair price after consultation with the community, accepting goods as well as cash, developing work schedules and identifying sites for re-treatment centres.

Overall, the project worked well. The three committees sold 4,756 insecticide treated nets, reaching an estimated 56 per cent of the target population. Each committee opened a bank account and set up a system to manage the funds received. An evaluation found that villagers bringing nets for re-treatment understood the main links between the cause of malaria and the protection offered by nets.

However there were problems, especially in training and supervision. Staff turnover at district level and in rural health centres meant that most new staff were untrained. The six-month delay between initial training and the delivery of supplies meant some trainees forgot

Key messages

- Communities can be effectively involved in promoting and selling insecticide treated nets.
- Good training and support is vital.
- Community involvement and sustainability should be considered in pilot projects.
- Pilot projects help identify issues around controlling malaria.

what they learnt. There were specific needs for extra training in calculating dilutions for re-treatment and in financial accounting. The malaria control committees wanted extra supervision and support but rural health centre staff were already overworked and generally unmotivated to provide extra support.

India

The Keonjhar project in Orissa wanted to see whether families in an isolated rural area where malaria was endemic would use insecticide treated nets. The project began in 1994 and involved the British Overseas Development Administration, the British Council, CARE India (an NGO) and the state government Health and Family Project.

As in Zambia, the project initially received free and low-cost supplies. Each family was encouraged to buy one untreated net at a subsidised price of 50 rupees (compared with the market price of 150 rupees) and trained how to treat nets with insecticide. Later, as supplies increased, families were encouraged to buy further nets for the same price.

The second phase of the project aimed to build local capacity by training women's groups to buy, promote and sell nets to other village families. At first, women travelled to the nearest town to buy netting. However, as demand grew, traders came to local markets, enabling women to negotiate lower prices for netting. One group learnt to sew their own nets.

Two years after the project had begun, 92 per cent of the 5,822 families in the project area had bought at least one net and over 40 per cent had bought a second net. An important factor was that the price of the nets compared well with the cost of treatment for malaria and the income lost due to illness.

However, it took considerable time and training by CARE and government field staff to realise the potential of the women's groups. They needed extra support and specific training, especially in how to treat nets with insecticide and in financial accounting. The groups were enthusiastic and worked well. However, at the end of the project, group activity stopped, although individual women continued to promote malaria control for their families and neighbours.

Pilot projects can also act as demonstration projects. The Christian Mission Hospital at Bissam Cuttack, also in Orissa, decided to support village malaria control programmes as part of its existing community health programme. Drawing on the experience of the Keonjhar project, it organised village meetings to discuss malaria and how villagers could tackle it. Each participating village chose individuals to order and distribute nets and collect the money from sales. The hospital supplied nets and insecticide for sale, and taught villagers how to treat and use the nets.

The Bissam Cuttack Project did not seek outside funding. Instead it sought to make the programme sustainable through net sales and re-treatment, arguing that the cost of treating malaria was so high that people found it worthwhile to invest in prevention by buying nets. However, the project did draw on the training materials and methodology developed by the Keonjhar project, as did other community projects run by smaller NGOs and church groups.

Scaling up

Small-scale pilot projects are essential to understand the problems and constraints of introducing new methods and messages. One of the greatest difficulties is in 'scaling up' small projects into much larger ones. It is a challenge for DHMTs to apply the lessons learnt and develop systems for dealing with larger areas and bigger populations.

Another problem is that results may be difficult to sustain, especially if the resources used for the pilot (funding for salaries, subsidised nets and insecticides) are no longer available. Therefore, it is important for pilot projects to try to incorporate elements of sustainability. Over the long-term, DHMTs must look at using resources from within the community. These could include:

- income generation from the sale and re-treatment of nets
- cost recovery by realistic pricing and accepting goods as well as cash
- working with local (rather than international) NGOs
- building malaria control into other community health programmes.

Training tips

The practical steps below were used in training courses for rural health workers in Malawi. These steps could also be used by a supervisor visiting health workers at their facilities. The aim is to explore the problems health workers face, to improve communication and to upgrade their skills in managing malaria.

1. Identify the health workers who see and treat people with malaria.
2. Arrange a seminar (or informal session) and invite key members of the malaria team.
3. Ask each person to describe his or her experience with malaria:
   - who gets malaria?
   - how severe are the cases?
   - what are the standard procedures for diagnosis and treatment?
   - what facilities are available for diagnosis and treatment?
   - where and how can patients be referred?
   - what are the indications for referral?
   - what treatment is given to cover the journey?
4. Then ask each person to describe his or her main problems with malaria:
   - how does malaria compare with other major diseases?
   - are facilities adequate to deal with it?
   - what improvements are needed?
   - are there community beliefs or practices that affect malaria management?
   - who provides care or services for malaria patients – family, health workers, traditional healers?
   - are these services effective and could they be improved?
5. If possible, visit a ward or clinic with participants to observe and discuss the history, early treatment-seeking, clinical features, diagnosis and treatment of malaria patients.
6. On the basis of the discussions and cases, identify areas where health workers' knowledge or practice could be improved. Suggest ways of improving practice using available resources.
7. Arrange for follow-up visits and, if possible, another seminar or session after six months or a year, to see what progress has been made.

Dr Malcolm Molyneux, Wellcome Trust

Resources

Management of severe and complicated malaria: A practical handbook, H M Gilles, WHO, Geneva, 1991.
Written in straightforward but fairly technical language, with key messages, photos and illustrations. Two chapters are on malaria in children and in pregnant women.
Available from: Distribution and Sales, WHO, Avenue Appia, CH-1211 Geneva 27, Switzerland. Price: Sw.Fr.6.50 (developing country readers); Sw.Fr.9 (others).

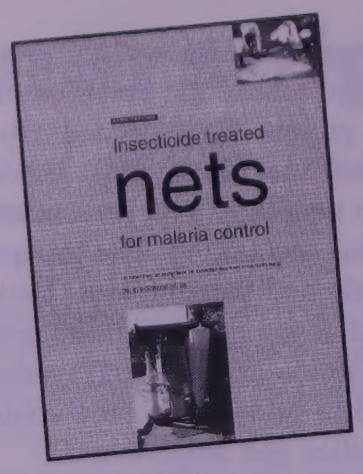
WHO Model Prescribing Information: Drugs used in Parasitic Diseases, WHO, 1990.
Provides information on the management of specific conditions and standard drug treatment.
Available from: WHO (address above). Price: Sw.Fr.14.70 (developing country readers); Sw.Fr.21 (others).

Practical Laboratory Manual for Health Centres in Eastern Africa, J Carter and O E Lema, AMREF, 1994.
An illustrated manual, covering laboratory management and techniques, with 10 pages on examining blood for malaria parasites.
Available from: AMREF, PO Box 30125, Nairobi, Kenya. Price: 300Ksh.

Partners for change and communication: guidelines for malaria control, S Mehra and S Meek, WHO in collaboration with Malaria Consortium, 1995.
Practical guidelines on how to work with communities to develop effective strategies for malaria control. Suitable for programme managers, planners and trainers working at regional or district level. Contains illustrations, exercises and practical examples.
Available from: WHO (address above); or Malaria Consortium, LSHTM, Keppel Street, London WC1E 7HT, UK. Price: free.

The Malaria Manual: Guidelines for the rapid assessment of social, economic and cultural aspects of malaria, I A Agyepong *et al*, Social and Economic Research, WHO, 1995.
Based on field work in Ghana, this practical guide includes chapters on collecting information, rapid assessment methods, community perceptions, training and resources, plus factual information on management of malaria. It contains case studies, exercises and illustrations.
Available from: WHO (address above). Price: free.

The Treatment of Malaria: information for non-pharmacists selling antimalarial drugs, WHO, 1995.
Written in simple language for traders selling antimalarial drugs in shops and markets. Useful for working in the community or the private sector.
Available from: Documentation Centre, CTD, WHO (address above) in English and French. Price: free



Insecticide treated nets for malaria control is a new AHRTAG directory aimed at managers of malaria control programmes for sub-Saharan Africa. It includes practical infor-mation on the preparation and use of treated mosquito nets, suppliers of finished nets, bulk netting and insecticides and a list of useful contacts and resource materials.
Available from: AHRTAG. Price: free.

Net Gain: A new method of preventing malaria deaths, C Lengeler, J Cattanai, D de Savigny, International Development Research Centre (IDRC) and WHO, 1996
A review of existing operational aspects of treated net technology, including a comprehensive technical section on nets and insecticides. It should be especially useful to district level managers and others implementing programmes.
Available from: IT Publications, 103-105 Southampton Row, London WC1B 4HH, UK. Price: £19.50 plus £3.90 p&p.

Organisations

Malaria Consortium is an international task force jointly developed by the London School of Hygiene and Tropical Medicine and the Liverpool School of Tropical Medicine. It draws together malaria control expertise from the two schools and other institutes and individuals worldwide.

For further information contact:
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E-mail: smeek@lshtm.ac.uk

Jenny Hill, Malaria Consortium, LSTM, Pembroke Place, Liverpool L3 5QA, UK. Fax: +44 151 707 0155
E-mail: j.hill@liv.ac.uk

Readers' challenge

How have you involved communities in malaria control?
Send your responses to:
Health Action, AHRTAG,
Farringdon Point,
29-35 Farringdon Road,
London EC1M 3LB, UK.

Health Action **provides a forum for exchange of experiences in implementing programmes in primary health care and related fields.**
It is aimed at individuals involved in planning, supervision and training, especially at district level, and those who support them, whether employed in government, non-governmental or multilateral organisations.

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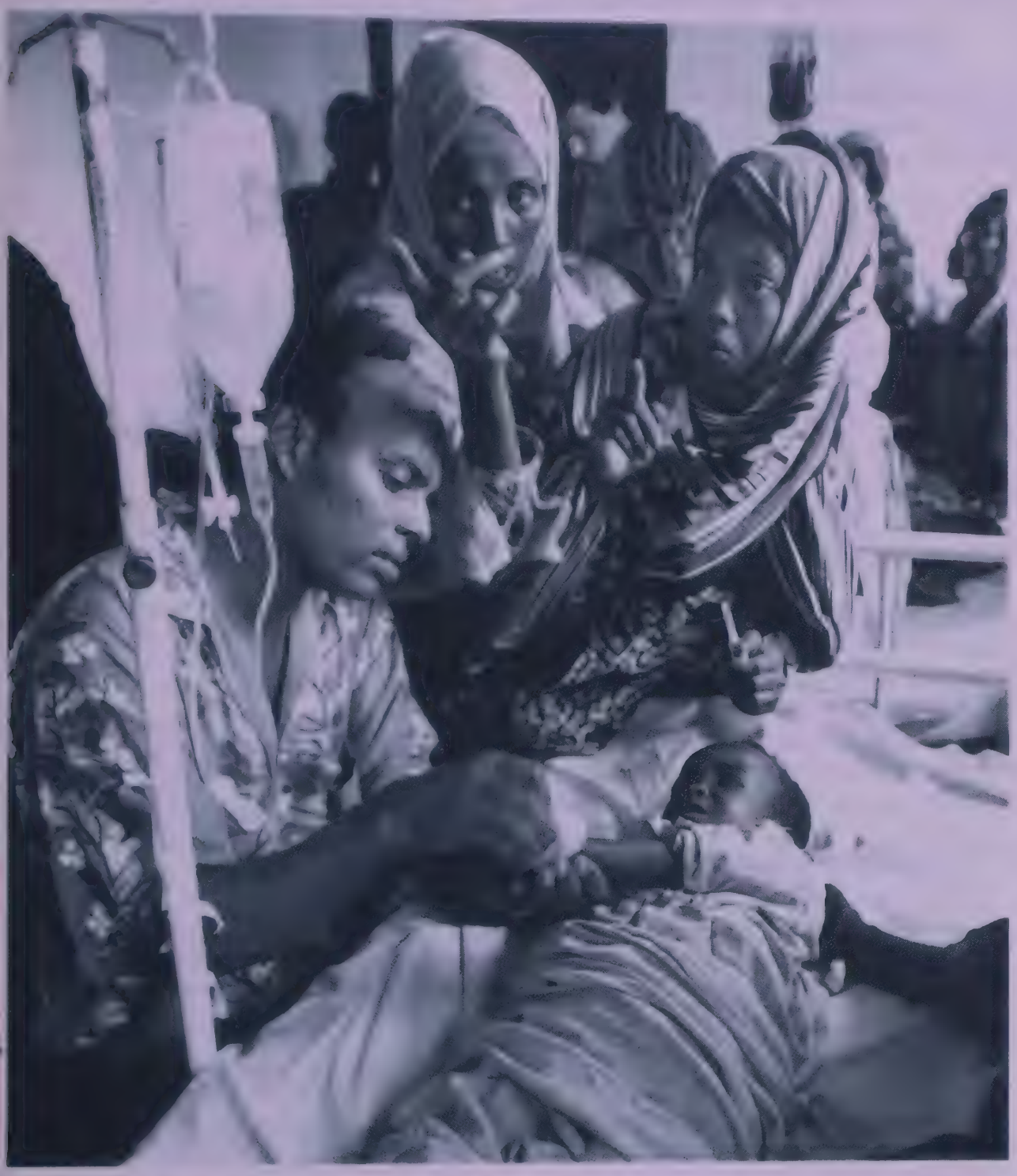
AHRTAG aims to promote policies and practices in health which are appropriate, sustainable and cost-effective. AHRTAG provides information on health and disability issues in developing countries, and provides technical support and training to partner organisations.

Managing malaria

Christine Luxemburger *describes the principles of management of childhood malaria.*



Treat severe malaria promptly as a medical emergency.

Children with malaria can develop severe life-threatening disease very rapidly. Correct management of acute malaria can:

- help prevent death
- prevent children with mild malaria from developing severe malaria
- resolve symptoms and clear parasitaemia rapidly.

To manage malaria correctly, health workers must know how to differentiate between mild and severe malaria (see page 6) and when to refer the child to hospital. Treatment and supportive care must be started quickly.

Principles of treatment

MILD MALARIA

Children with mild malaria can be treated as outpatients. The illness and intended treatment should be explained carefully to the mother or carer of the child. The health worker should always watch as the child is given the first dose of an antimalarial drug before leaving the clinic. It is very important to make sure the child does not vomit back the drug. If this happens the child may not get enough treatment and go on to develop severe malaria.

All children with a high fever (above 38.5°C) should first receive paracetamol (15mg/kg). When the fever has reduced and the child is calm, give the antimalarial with a spoon or syringe (without the needle) after the tablets have been crushed and mixed with water. A sweet drink or breastmilk should be given immediately after the medicine has been swallowed. The child should be observed for one hour. If the child vomits during that time, treatment should be repeated (full dose if the drug is vomited before 30 minutes, half dose if vomited between 30 minutes and one hour). If the child vomits repeatedly, he or she **must** be hospitalised.

Home care messages for the mother should include the importance of:

- giving the prescribed treatment for the correct length of time (see page 11)
- encouraging breastfeeding and fluid intake
- treating the fever (if the child has a high fever when seen, prescribe paracetamol for 2-3 days at home)
- returning immediately if the child's fever persists beyond 2-3 days, if he or she does not drink or vomits repeatedly, or if signs of severe illness such as reduced consciousness, convulsions, fast breathing, pallor or jaundice appear.

Fever which persists after 2-3 days or which returns after a few days of antimalarial treatment may indicate

Key messages

Mild malaria

- Select appropriate antimalarials according to the resistance patterns and national policies.
- Always supervise the administration of antimalarials.
- Describe the signs of the main malaria complications to the mother before sending the child home.

Severe malaria

- Treat promptly as a medical emergency.
- Give the first dose of quinine and treat convulsions prior to referral.
- Monitor the child closely to detect the most common complications: severe anaemia, convulsions and hypoglycaemia.

Assessing and monitoring a child with severe malaria

Assessment

Ask about:

- past history including previous malaria attacks, known allergy to antimalarials
- history of present attack, including onset of fever, general condition, convulsions at home, liquid and food intake, urine output, self-medication prior to being admitted

Check:

- clinical signs: pulse, respiratory rate and rhythm, hydration status
- signs of other diseases such as meningitis or pneumonia
- level of consciousness using a coma scale you are familiar with.
  For example:
  A = 0 Is the child **A**lert?
  V = 1 Is the child responding to **V**oice?
  P = 2 Is the child responding only to **P**ain?
  U = 3 Is the child **U**nresponsive to stimulation?
- laboratory findings: parasite counts, haemoglobin or haematocrit, glucose level.

Monitoring

Place the child in a bed where the nurses can observe easily and frequently.

Check:

- IV drip rates and site hourly until the child is stable, then reassess fluid requirements
- urine output and hydration status hourly during the start of treatment and then two hourly until the child is stable
- the pulse, respiratory rate and rhythm, coma score every two hours until the child wakes up and is stable
- the haemoglobin or haematocrit after 24 hours if the child had severe pallor on admission, or at any time if signs of heart failure appear (see page 10)
- the child's blood sugar level: at the end of the quinine loading dose and if there is any deterioration in the level of consciousness or any convulsion.

A doctor should review the child at least twice day or any time the child's condition deteriorates.

If coma and fever persist, be aware of the common association of severe malaria with meningitis, pneumonia or sepsis.

treatment failure. The malaria might be resistant to the drug, the drug might be poorly absorbed, or the child may have received incomplete treatment. Health workers need to respond quickly to treatment failure to prevent severe malaria from occurring. Reassess the child and check national guidelines for alternative antimalarial drug therapy.

SEVERE MALARIA

Management at clinic level

Children with signs of severe malaria must be hospitalised. Severe malaria is a medical emergency. A child's life can be saved if health workers at clinics and health centres are trained and equipped to start treatment before transporting the child to the nearest hospital.

1. Give the first intramuscular injection of quinine.
2. Treat convulsions with intrarectal diazepam (0.4mg/kg).
3. Send a note with the child which clearly states the drugs already given with the dosage, route, date and time of administration. Also write a brief description of the child's clinical history and examination findings.

Management at hospital level

On admission assess the child's condition (see box on left). Principles of management involve:

- giving appropriate dosages of antimalarials. In most places intravenous infusion of quinine is the treatment of choice (see page 11).
- close monitoring and nursing of the child to recognise, prevent and treat complications such as severe anaemia, convulsions and hypoglycaemia.* Management of anaemia is described on page 10. Hypoglycaemia can be prevented by encouraging food and drink intake when the child is conscious and replacing glucose intravenously when necessary. Treat convulsions with intrarectal diazepam (0.4mg/kg).

Children with malaria often have other infections at the same time, especially meningitis and pneumonia. Children must be carefully examined at least twice a day and any time that their condition does not improve or gets worse.

Supportive care

Nurse an unconscious child on his or her side. Encourage the mother to turn the child every two to three hours, and to change soiled or urine soaked linen. Clean the child's eyes and mouth regularly. When the child is conscious, encourage liquid intake or breastfeeding.

Dr Christine Luxemburger, Shoko Malaria Research Unit, PO Box 46, 63110 Mae Sod, Thailand

**Note:* CHD3/4 *described management of convulsions and hypoglycaemia in detail. Please write to AHRTAG if you would like a copy of this issue.*

Case study answers from page 12

1. Malaria and/or pneumonia.
2. Thick blood slide and haemoglobin. A blood slide is the only sure way to diagnose malaria. However at health centre level the health worker may not have the equipment or skill to do a blood slide and should assume malaria and start treatment. Haemoglobin assesses the degree of anaemia.
3. No, although Khatija had a single convulsion no signs of severe malaria were present. If she had history of repeated convulsions she would need referral.
4. Reduce the fever then give an antimalarial drug and an antibiotic for pneumonia. Follow up in two days.
5. Continue with the antimalarials and antibiotics. Discuss diet and provide ferrous sulphate tablets daily for the anaemia. Folic acid is unnecessary.
6. YES, this is your vital chance to get the preventive message across that insecticide treated mosquito nets help to reduce child morbidity and mortality from malaria.
7. YES, first-time pregnancy inhibits immunity to malaria, so this girl and her baby are at particular risk from malaria and its effects. Second, she will have lost her immunity having lived in the highlands for some years. Advise her to sleep under an insecticide treated net and attend antenatal care regularly.

Malaria in pregnancy

***Katie Reed** outlines the effects of malaria in pregnancy.*

Health workers caring for pregnant women must be aware of how malaria affects a woman and her unborn child.

- Pregnancy reduces women's ability to fight malaria, especially during a woman's first pregnancy.
- Women with a low level of immunity to malaria are particularly at risk from cerebral malaria, complications associated with high fevers, and delivering babies with congenital malaria.
- Even women with immunity are at risk from severe anaemia and poor fetal growth, leading to low birth weight babies.

Pregnant women have attacks of malaria more often and more severely than non-pregnant women from the same area and are more likely to die from malaria. The table below shows the effects of malaria in pregnancy.

Key messages

- Screen and check all pregnant women for signs of anaemia and malaria.
- Always investigate and treat the cause of anaemia.
- Give routine antimalarial drugs and iron supplementation according to national policy.

Care during pregnancy

Health workers involved in antenatal care can play four important roles in controlling malaria during pregnancy:

- screening
- monitoring
- treating complications
- providing health education.

1 Screening

At the beginning of pregnancy or each time a woman is referred to a different health worker, ask where she lives, where she has come from and how many pregnancies she has had. A woman is most at risk from malaria during her first pregnancy. She is also at risk if she has come from an area of little malaria to stay in an area where malaria is endemic.

Check if the woman is already anaemic. Does she have pale conjunctiva or palms? Does she have a history of previous pregnancies or illness that suggests anaemia? A woman may be anaemic before she starts her pregnancy due to poor nutrition, frequent pregnancies, malaria or hookworm. If these conditions are not treated and a woman suffers repeat malaria attacks during pregnancy, she may develop severe anaemia. Check haemoglobin level and, where appropriate, do a sickle test and stool test for hookworm.

Does she have a fever or recent history of fever? Always suspect malaria in addition to other pregnancy related causes such as urinary tract infection. If possible, take a blood slide to check for malaria parasites.

Ron Giling/Panos Pictures

2 Monitoring

At every visit

- examine the mother for signs of anaemia and malaria
- monitor fetal growth by examining the mother's abdomen.

3 Treating complications

At all stages in pregnancy, problems found through screening, monitoring or mentioned by the mother should be treated. Pregnant women with convulsions, high fever or severe anaemia should be referred for more specialised care.

Treatment of malaria in pregnant women depends on national guidelines. In some countries, national policies recommend routine use of antimalarial drugs during pregnancy. Detect and treat anaemia and any underlying causes (see page 10).

4 Health education

In areas where malaria is endemic, pregnant women should be warned that they are at special risk of anaemia and fever. Sleeping under an insecticide-treated bed net can help prevent bites from mosquitoes.

Anaemia is a potential risk for all pregnant women. Encourage women to eat more locally available foods rich in iron.

Katie Reed, 30 De Lacy Mount, Leeds LS6 3JF, UK.

Effects of malaria in pregnancy

Condition	Possible effect	Notes
Severe anaemia	heart failure (see page 10)	Usually occurs before 30 weeks of pregnancy. A woman with pregnancy-induced hypertension may have similar symptoms, but it is more likely to occur later in pregnancy (after 30 weeks).
	poor fetal growth, premature labour, stillbirth	Malaria parasites in the placenta 'block' the flow of oxygen and nutrients from the mother to the baby.
	shock	Anaemic women are more prone to shock if they bleed heavily during delivery.
	more risk of infection, slow recovery after birth	
High fevers	miscarriage, premature labour, stillbirth	High fever during labour can cause complications.
Cerebral malaria	confusion, coma, convulsions	These signs may also be caused by meningitis, epilepsy, hypertension or eclampsia.
Other	congenital malaria	Babies can be born with malaria or develop it very soon after delivery, due to parasites passing through a damaged placenta before or during delivery.

Readers' challenge

How could you improve access to antenatal care for all first-time mothers? Please write in with your suggestions. Readers whose suggestions are published will receive a manual on malaria control.

How to .... manage anaemia

Jane Carter describes how to detect and treat anaemia.

Anaemia is common in developing countries, particularly in children under three and women of child bearing age. Early detection and treatment of anaemia may uncover underlying illness and avoid the need for blood transfusions, which carry the risk of transmitting HIV and hepatitis viruses.

How to recognise anaemia

Common symptoms of anaemia are weakness, tiredness, shortness of breath (especially with exercise), a rapid or strong heart beat (palpitations), dizziness, fainting and headaches. Common signs of anaemia are:

- pallor of the conjunctiva and palms
- fast pulse and fast breathing.

Pallor may not be obvious, so mild anaemia is often missed. In severe anaemia, children or adults may also show signs of heart failure (see box).

The severity of anaemia and the need for transfusion depend on the speed at which anaemia has developed and the age of the person. If anaemia develops slowly the body adjusts and there are fewer symptoms. Children adjust better than adults.

Drugs for treating anaemia

Always carefully check the iron content of different preparations to avoid overdosage.

Ferrous sulphate tablets
(200mg salt; 65mg elemental iron)
dose 3–6 mg/kg elemental iron per day in divided doses

AGE or	WEIGHT	DOSAGE
6 up to 12 months	5–9.9kg	½ tablet
1 up to 6 years	10–19.9kg	1 tablet
6 up to 14 years	20–39.9kg	2 tablets
adults	40–59.9kg	3 tablets

Iron syrups can also be used for children. The dose is the same: 3–6mg/kg elemental iron per day.

For **ferrous sulphate syrup** (100mg salt/5ml)
For an infant under 1 year
the dosage is 2.5–5ml (½–1 teaspoon).
For a child aged between 1 and 5 years
the dosage is 7.5–10ml (1½–2 teaspoons).

Folic acid tablets
(5mg): daily

AGE or	WEIGHT	DOSAGE
less than 6 years	less than 20kg	½ tablet
over 6 years	more than 20kg	1 tablet

If available, iron/folate tablets can be used. Calculate the dose according to the iron concentration.

How to diagnose anaemia

Wherever possible, confirm anaemia by measuring haemoglobin or haematocrit levels. The lower limits of the normal range are:

	haemoglobin	haematocrit
Children		
under 6 years	9.3g/dl	27%
under 12 years	10.7g/dl	34%
Pregnant women	10.0g/dl	30%

Common causes of anaemia in developing countries are malaria, nutritional deficiencies, hookworm, schistosomiasis and, in some areas, sickle cell disease. Simple tests include blood slides for malaria, stool or urine examination and a sickle cell test.

Management of anaemia

Always ask parents about the child's usual diet. If poor diet has resulted in anaemia, provide nutrition advice (see box top right) and supplement with iron and folic acid (see box below for dosages). Intramuscular or intravenous iron can cause severe side effects and are **not** recommended. Follow up anaemic adults and children (every 1–2 weeks), until the haemoglobin level is normal. Continue to give iron and folate supplements for a further three to six months. The haemoglobin level should rise roughly 1 g/dl every 7–10 days, although children recover faster than adults.

Treat underlying causes. Public health education helps prevent re-infection.

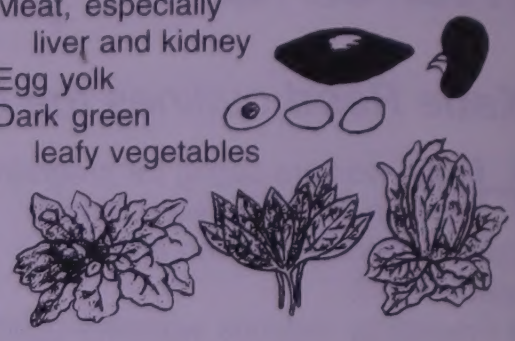
When to give blood

Blood transfusions should be restricted to life saving situations. Even adults and children with extremely low haemoglobin (less than 5g/dl) who are clinically stable, do not require transfusion.

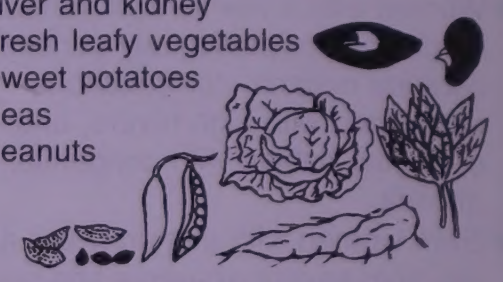
The decision to transfuse *must* be based on a careful assessment of the haemoglobin level *and* the clinical state of the patient. Only give a transfusion when haemoglobin levels are less than 5g/dl *and* there are signs of heart failure.

Blood transfusions do not treat the underlying cause of anaemia. Investigations and therapy are still required.

Foods rich in iron
Meat, especially
liver and kidney
Egg yolk
Dark green
leafy vegetables



Foods rich in folic acid
Liver and kidney
Fresh leafy vegetables
Sweet potatoes
Peas
Peanuts



Ingrid Emsden/AHRTAG

Signs of heart failure

- swelling of the ankles (oedema)
- fluid in the bases of the lungs (crackles)
- enlarged liver
- raised veins in the neck.

In infants other signs are:

- a grunting noise
- abnormal chest movements
- nasal flaring
- fast pulse and rapid breathing.

Management of blood transfusion

Only give blood transfusions in health facilities where a proper clinical assessment can be made and where correct procedures for collecting, grouping, cross-matching, screening and storing blood can be carried out.

Children should receive 15–20ml/kg whole blood or 15ml/kg packed cells. Adults require a minimum of two units of blood. Blood should be hung up for 30 minutes before transfusion to allow the red cells to settle. Transfusion should be given slowly, over 4–6 hours. The pulse and respiratory rate should be monitored and the chest examined to detect volume overload. If the child or adult has a low blood volume (cold hands and feet) the first 5–20 ml/ kg may be given rapidly over 30 minutes. Diuretics can be given if signs of pulmonary oedema appear (frusemide 1 mg/kg).

Jane Carter, Head of Clinical Services, AMREF, PO Box, 30125, Nairobi, Kenya

Treating malaria

Chloroquine is the most widely used antimalarial in the world. It is highly effective against clinical attacks of *P. vivax, P. ovale* and *P. malariae* malaria, and sensitive infections of *P. falciparum* malaria. Persistence and recurrence of clinical symptoms within two weeks, or a slow recovery of anaemia may indicate resistant *falciparum* malaria. Chloroquine resistant *vivax* malaria has now emerged in East Asia and the Pacific. However, chloroquine remains important because:

- most health workers have it in stock
- even in resistant cases, chloroquine may be helpful if used in combination with another antimalarial, or as initial treatment prior to referral.

Quinine is the standard treatment for severe malaria. It is used as an initial IM injection while the person is referred, as a slow IV infusion in a health facility, or as an oral treatment.

P Merchez/WHO

DRUG	CHLOROQUINE	QUININE (dihydrochloride, hydrochloride, sulphate)
BRAND NAMES	Aralen, Avlochlor, Nivaquine, Resochin and many others	Many
WHEN TO USE	• uncomplicated chloroquine-sensitive *falciparum* malaria • *vivax, malariae* and *ovale* malaria	• **IV/IM** severe and complicated malaria • **ORAL** follow up treatment for severe and complicated malaria • in selected areas: oral treatment of uncomplicated, multi-drug resistant *P. falciparum* malaria
POSSIBLE RISKS/ SIDE EFFECTS	• itching: will disappear when treatment finishes • headaches, nausea • **overdose: five 150mg tablets in a single dose can be fatal for children**	• tinnitus, muffled hearing, vertigo or dizziness; normally reversible • hypoglycaemia occurs frequently • severe hypotension if infused too rapidly • overdose: 1g can be fatal in children
CONTRA-INDICATIONS	Avoid if a child has already taken the correct dose of chloroquine for the current illness for three days without success	Known hypersensitivity
HOW TO GIVE	**ORAL,** with a meal and plenty of water: to mask the bitter taste, crushed tablets can be given with banana or other local food If the child vomits within 30 minutes, repeat the full dose; if the child vomits between 30 and 60 minutes, give an additional half dose.	**IV** Give SLOWLY. Never give a dose in less than 4 hours. Beware of hypoglycaemia. **IM** Dilute to a concentration of 60mg/ml. Give single dose before referral, divided into two halves. Give one half into the outer part of each thigh. If referral is not possible, follow IM schedule until the child can take oral drugs. **ORAL** Start as soon as possible; give with a meal and plenty of water.
PREPARATIONS	**Tablets** 100mg, 150mg, 300mg base as phosphate/sulphate **Syrup** 50mg/ml as phosphate/sulphate 150mg base = 250mg phosphate = 200mg sulphate	**Quinine hydrochloride** 2ml ampoules containing 150mg/ml **Quinine dihydrochloride** 2ml ampoules containing 150mg/ml or 300mg/ml **Tablets** quinine sulphate, 200mg, 300mg
FREQUENCY OF DOSAGE	Once a day for three days: 10mg/kg orally on the first and second days, 5mg/kg on the third day (total dose 25mg/kg)	**IV** Always give slowly. Give an initial loading dose of 20mg/kg SLOWLY over a 4-hour period (except reduce to 10mg/kg if the child received quinine within the past 24 hours or mefloquine within the past 7 days) – dilute in 5–10ml/kg of a suitable IV fluid. Then 10mg/kg 8 hours after the start of the previous dose, repeated every 8 hours. After 48 hours of IV therapy, reduce the dose to 5mg/kg if IV therapy is still required. **IM** Always dilute IM quinine to a concentration of 60mg/ml. Dilute 2ml ampoules containing 150mg/ml with 3ml 0.9% sodium chloride injection. Dilute 2ml ampoules containing 300mg/ml with 8ml 0.9% sodium chloride injection. Give 10mg/kg, repeat after 4 hours, repeat again 4 hours later, then repeat dose every 12 hours until the child can swallow oral medication. **ORAL** 10mg/kg 3 times a day, for 7 days total (including time on IV or IM therapy).
STORAGE	Store in a closed container in a dry place, away from light.	Protect from light

Chloroquine

	Tablets 100mg		**Tablets** 150mg		**Syrup** 50mg/5ml	
AGE (years)	Days 1 & 2	Day 3	Days 1 & 2	Day 3	Days 1 & 2	Day 3
less than 1	1	1/2	1/2	1/2	7.5ml	5ml
1 up to 3	1 1/2	1/2	1	1/2	15ml	5ml
4 up to 6	2	1	1 1/2	1/2		
7 up to 11	3 1/2	1 1/2	2 1/2	1		
over 11	6	3	4	2		

CAUTION: The use of intramuscular chloroquine injections may lead to sudden death. IM injections should **NOT** be used in children.

Quinine

AGE	WEIGHT	IV (undiluted)		IM (diluted)	ORAL (tablets)	
		150mg/ml	300mg/ml	60mg/ml	200mg	300mg
2 up to 4 months	(4-6kg)	0.4ml	0.2ml	1ml	1/4	-
4 up to 12 months	(6-10kg)	0.6ml	0.3ml	1.5ml	1/3	1/4
1 up to 2 years	(10-12kg)	0.8ml	0.4ml	2ml	1/2	1/3
2 up to 3 years	(12-14kg)	1ml	0.5ml	2.5ml	3/4	1/2
3 up to 5 years	(14-19kg)	1.2ml	0.6ml	3ml	3/4	1/2

Never exceed these dosages. A single dose of 1g of quinine can be fatal in children and is usually preceded by central nervous system depression and seizures.

Thanks to Drs PI Trigg and AEC Rietveld, of the Malaria Unit, Division of Control of Tropical Diseases, WHO, Geneva, Switzerland, for providing the basic information.

The following summary and comment on recent research papers on child health was prepared in collaboration with the editorial office of *The Kangaroo: Bibliographic archives for maternal and child health*. This journal is published twice a year with summaries and comments on key research papers published in international journals. For more information about *The Kangaroo* write to: Bureau for International Health, Istituto per l'Infanzia, Via dell'Istria 65/1, 34137, Trieste, Italy (fax: +39 40 3785 402). Readers from developing countries can subscribe to *The Kangaroo* at reduced rates. Free subscriptions may also be available.

For a copy of the full research studies, contact AHRTAG.

- **Efficacy trial of malaria vaccine SPf66 in Gambian children.** D'Alessandro U, Leach A, Drakeley CJ, et al. Lancet 346: 462-7, 1995.
- **Randomised double-blind placebo-controlled trial of SPf66 malaria vaccine in children in northwestern Thailand.** Nosten F, Luxemburger C, Kyle DE, the Shoklo SPf66 Malaria Vaccine Trial Group et al. Lancet 348: 701-7,1996.

Abstracts: In The Gambia a controlled trial on 630 children aged 6 to 11 months at time of the first dose was carried out to determine the protective effect of an experimental vaccine against clinical malaria. The children received three doses of the vaccine, while a control group had three doses of injected polio vaccine. No differences in mortality or health centre admissions were found between the two groups. The vaccine showed a protective effect against the first or only clinical episode of 8% and against the overall incidence of clinical episodes of 3%. No significant differences in parasite rates or any other index of malaria were found between the two groups.

In Thailand 1,221 children aged 2 to 15 years were randomised to three doses of either the malaria vaccine or a vaccine for hepatitis B. After three doses, 73% of recipients of the malaria vaccine had seroconverted. There were 195 first cases of *falciparum* malaria in the SPf66 recipients and 184 cases in the control group. The malaria vaccine showed no protective effect.

Comment: These findings confirm the lack of effect of the SPf66 malaria vaccine in contrast to the borderline effect found in Tanzania. The SPf66 malaria vaccine does not protect against *falciparum* malaria and further trials are not warranted.

Learning exercise – case study

Khatija, a two-year-old who lives on the coast in a country where malaria outbreaks occur in the wet season, presented with a three-day fever, snuffly nose and recent convulsion. She had been bathed in a herb for the fit and given one tablet of chloroquine. On examination she was hot and pale with fast breathing (rate > 60/min). Her chest was clear apart from coarse sounds coming from her throat. Her neck was not stiff.

1. What are the two most likely causes of Khatija's illness?
2. What simple laboratory tests would help the clinical management of Khatija?
3. If malaria, are there any features suggesting severe or complicated malaria?
4. How would you treat Khatija?

After 48 hours Khatija was better, eating and drinking but still very pale.

5. What advice would you give the mother and what treatment to take home?
6. Are there any preventive measures for malaria that you might discuss with the family – especially the father who decides how to spend the money?

The family tell you their pregnant daughter is returning from the highlands after many years.

7. Are there any risks that you would like to warn the family about? What advice would you give?

See page 8 for answers.

M Oyedela/WHO

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